

**Application No.: 10/696,591**  
**Filing Date: October 28, 2003**

### **REMARKS**

Claims 1-13, 15-16 and 18-34 are pending in the present application. No new matter has been added. Applicants respectfully request reconsideration in view of the following remarks.

#### **Allowable Subject Matter**

Claim 21 has been objected to as being dependent upon a rejected base claim but deemed allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims. Applicants thank the Examiner for allowable subject matter but respectfully refrain from rewriting Claim 21 at this time in view of the allowability of the other claims, as discussed below.

#### **Claim Rejections Under 35 U.S.C. §103**

Claims 1-10, 22-24 and 34 have been rejected as unpatentable over Gordon et al. (WO 02/27063). Claims 5, 11-13, 15-16, 18-20, 25-27 and 31-33 have also been rejected as unpatentable over Gordon et al. in view of Hintermaier et al. (U.S. Patent No. 6,177,135). Claims 28-30 have been rejected as unpatentable over Gordon et al. in view of Hintermaier et al. and further in view of Kil (2003/0124875). Applicants respectfully traverse these rejections.

On pages 2-3 of the Office Action, the Examiner responds to Applicants' amendment and arguments of September 25, 2008. Applicants submit the following in response.

#### **A *prima facie* case of obviousness has not been established**

The Examiner first responds to Applicants by alleging that Gordon et al. 'broadly' teaches the claimed ALD process because Gordon et al. discloses "precursors with their reactivity adapted for the CVD or ALD of metal silicates, phosphate, or oxides." However, Applicants submit that the Examiner has failed to provide *any reason* to arrive at the combinations of elements specifically recited in independent Claims 1, 10 and 26. The Court in *KSR* held that "there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." (*KSR*, 550 U.S. at \_\_\_, 82 USPQ2d at 1396 quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)).

Applicants note that Gordon et al. broadly discloses “CVD *or* ALD” of “metal silicates, phosphates *or* oxides.” Moreover, only two bismuth compounds are included in a list of almost 150 other volatile metal or metal amides. However, there is no teaching in Gordon et al. of depositing any kind of bismuth film, much less a bismuth oxide film by ALD. The Examiner has not articulated any reasoning for why it would have been obvious from Gordon et al. to use, *specifically*, the claimed “organic bismuth compound” by an ALD process for depositing a “bismuth-containing *oxide* thin film” as recited in independent Claim 1. (See Gordon et al., page 2, lines 23-25, p. 16, lines 1-3, Table 1). Applicants submit that the broad disclosure of CVD or ALD of many different types of films provides no reason to deposit a specific type of bismuth film by a specific process using a specific precursor.

Applicants note that Table 1 of Gordon et al. lists almost 150 volatile compounds along with their melting points and vapor pressures culled from various technical references and literature. However, Gordon et al. does not teach that *all* of the compounds can be used in CVD and ALD for depositing any type of film, and as discussed below, the skilled artisan would understand that *not all* of the precursors can be used in ALD. In particular, Gordon et al. does *not* teach the use of the two bismuth compounds listed in Table 1 to form *any film*, and the Examiner has provided no reason for why the skilled artisan would select either of the two bismuth compounds specifically to form any particular film. Moreover, other than listing the two bismuth compounds in Table 1, there is no teaching in Gordon et al. of forming specifically a *bismuth oxide film* by any process. The Examiner has likewise provided no reason, technical or otherwise, for why the skilled artisan would be led to select the two bismuth compounds listed in Table 1 specifically to form a bismuth oxide film by ALD.

Accordingly, Applicants submit that the skilled artisan would not interpret Gordon et al. to teach the deposition of *any* oxide, silicate and phosphate using *each* of the 150 listed compounds by CVD *and* ALD. For example, Applicants refer to the Declaration of inventor Suvi Haukka, submitted herewith. As described in paragraph 9, Applicants submit that the skilled artisan would have found many of the compounds listed in Table 1 *not suitable for ALD* because, e.g., they have insufficient vapor pressure or decompose when evaporated. Thus, Applicants submit that the Examiner must provide *some reasoning*, technical and with rational underpinning, for why the skilled artisan would actually select the two bismuth compounds listed

Application No.: 10/696,591  
Filing Date: October 28, 2003

in Table 1 to form a bismuth oxide film by ALD, to support his conclusion of obviousness. The Examiner has not provided any such reasoning whatsoever.

Thus, Applicants submit that the Examiner has failed to establish a *prima facie* case of obviousness for the ALD processes recited in independent Claims 1, 10 and 26.

The claimed ALD processes are not obvious in view of Gordon et al.

Applicants further submit that the general disclosures in Gordon et al. **would not** have led the skilled artisan to arrive at the ALD processes recited in Claims 1, 10 and 26.

As noted above, and contrary to the Examiner's assertion, the skilled artisan would not expect all of the compounds listed in Gordon et al. to be useable for both CVD and ALD reactions. Applicants submit that the properties of compounds that would make them suitable for ALD cannot be anticipated by their structure. Indeed, as described in paragraph 8 of the Declaration, the skilled artisan would not know based on the teaching of Gordon et al. which of the precursors listed in Table 1 would be suitable for ALD merely based on its known properties, such as chemical structure or boiling point.

In particular, the skilled artisan would appreciate that each compound would have to meet the at least five specific criteria described in paragraph 5-7 of the Declaration in order to provide for the self limiting reactions of ALD. Thus, Applicants submit that the skilled artisan would **not assume** that all the compounds generally listed in Table 1 of Gordon et al. would be suitable for ALD. For example, the skilled artisan would understand that lanthanum silylamides, such as  $\text{La}(\text{N}(\text{SiMe}_3)_2)_3$ ,  $\text{La}(\text{NBuSiMe}_3)_3$  and  $\text{La}(\text{NPr}_2)_3$  in Table 1 and  $\text{LaCp}_3$  in Table 2 could not be used in ALD because they are too unstable. (See Declaration at paragraph 9, and Haukka, S., ECS Transactions 3 (15) 15-26 (2007) at p. 20).

As noted above, Gordon et al. fails to teach or suggest that the two listed bismuth compounds specifically would be suitable for providing the self limiting reactions of ALD at the claimed temperature. In the absence of this teaching, Applicants submit that the skilled artisan would have had **no reason** to select the two bismuth compounds in Table 1 to use in an ALD process of forming bismuth oxide films, as described in paragraph 11 of the Declaration. Applicants submit that the two listed bismuth compounds would not have been obvious choices

**Application No.:** 10/696,591  
**Filing Date:** October 28, 2003

for use in ALD of bismuth oxides based only on their chemical structure, melting points and vapor pressure.

Moreover, the claimed ALD processes recite further specific reaction conditions. The Examiner correctly concedes on page 4 of the Office Action that Gordon et al. does not teach that bismuth oxide could be deposited at a temperature “of less than about 250°C” as recited in Claims 1, 10 and 26, but alleges that this limitation would have been obvious “by routine experimentation.” However, Gordon et al. does not even specifically teach an ALD process of depositing a bismuth oxide film using an organic bismuth compound. Absent this teaching, Applicants submit that the claimed deposition temperature cannot be obvious because Gordon et al. does not even teach the ALD process that the skilled artisan would allegedly experiment with.

Indeed, given the specific criteria for compounds to be suitable for ALD, Applicants also submit that obviousness of the claimed ALD processes cannot be alleged from the ‘general guidance’ in the broad disclosure of Gordon et al. The Federal Circuit has stated that it may not be appropriate to bar patents merely because it was obvious “to explore a new technology or general approach that seemed to be a promising field of experimentation, where the prior art gave only general guidance as to the particular form of the claimed invention or how to achieve it.” (*In re O’Farrell*, 853 F.2d 894 at 903 (Fed. Cir. 1988)).

Thus, Applicants submit that the claimed ALD process for forming a “bismuth-containing oxide thin film” using the claimed “organic bismuth compound” and further “at a temperature less than 250°C” as recited in Claim 1 is not obvious in view of the teachings of Gordon et al. Applicants submit that the combinations recited in independent Claims 10 and 26 are not obvious in view in view of the teachings of Gordon et al. for similar reasons.

#### There is no reasonable expectation of success

Applicants submit that because the skilled artisan cannot predict the ability of a compound to work in ALD, based on known properties such as chemical structure, and because there is no teaching in Gordon et al. that the two bismuth compounds can even be used in ALD to deposit bismuth oxide at the recited temperature, there would have been no reasonable expectation of success in the ALD methods recited in Claims 1, 10 and 26. Applicants also

submit that there would have been no reasonable expectation of success in combining the teachings of Gordon et al. and Hintermaier et al.

The Examiner alleges that because Hintermaier et al. teaches a CVD precursor, the skilled artisan would recognize that “depositing the precursor of Hintermaier et al. without other reactive gases is analogous to the first step of the ALD process of Gordon et al. of depositing the first reactant.” The Examiner further alleges that the skilled artisan would expect a reasonable expectation for success “as the CVD precursor of Hintermaier et al. can be deposited as it would be in an ALD process.” Applicants respectfully disagree and submit the following in response.

Applicants submit that the skilled artisan would know that ALD process is generally comprised of self limiting reactions, as described in paragraphs 5-8 and 10 of the Declaration. For example, a compound in the first step of ALD meets at least the five kinetic criteria to provide for self limiting reactions, described in paragraph 5 of the Declaration. However, the skilled artisan would also understand that CVD is *not* comprised of self limiting reactions and likewise, a CVD precursor does not need to meet any of the criteria specific to compounds used for ALD. Thus, contrary to the Examiner’s assertion, using the precursor of Hintermaier et al. without other reactive gases is *not analogous* to the first step of the ALD process, and the skilled artisan would appreciate these differences. Accordingly, Applicants submit that the skilled artisan would not have expected success in combining the teachings of Hintermaier et al. and Gordon et al. for the reason that the Examiner states.

Indeed, as discussed above and in the Declaration, Applicants submit that it is not reasonable to assume that a CVD precursor will work in ALD. Accordingly, Applicants submit that the skilled artisan would *not* have had a reasonable expectation for success in using any of the compounds in Table 1 of Gordon et al. or any of the CVD precursors of Hintermaier et al., because the skilled artisan would not have assumed that the compounds generally disclosed in Gordon et al. or Hintermaier et al. have the specific properties suitable for the self limiting reactions of ALD. In contrast, the Examiner has provided no evidence to support his allegation that the skilled artisan would have had a reasonable expectation of success in using the claimed precursor in the claimed ALD processes.

Applicants submit that not only is ALD not analogous to CVD, but as a chemical art, ALD is also an ‘unpredictable’ art. The Federal Circuit has held that “[t]o the extent an art is

**Application No.:** 10/696,591  
**Filing Date:** October 28, 2003

unpredictable, as the chemical arts often are, KSR's focus on 'identified, predictable solutions' may present a difficult hurdle because potential solutions are less likely to be genuinely predictable." (*Eisai Co. Ltd. v. Reddy's Labs. Ltd.*, 533 F.3d 1353, 1359 (Fed. Cir. 2008)). As for other chemical arts, Applicants submit that the compounds that are suitable for ALD cannot be easily determined based, for example, on compounds that are used in other well known chemical deposition methods. Thus, in the absence of any specific teaching in the cited references, Applicants submit that the pending claims cannot be considered obvious.

Thus, Applicants maintain that the claimed ALD process for forming a "bismuth-containing oxide thin film" using the claimed "organic bismuth compound" and further "at a temperature less than 250°C" as recited in Claim 1 is not obvious in view of the teachings of Gordon et al. Applicants submit that the combinations recited in independent Claims 10 and 26 are not obvious in view of the teachings of Gordon et al. for similar reasons.

For at least the forgoing, Applicants respectfully request withdrawal of the rejections to Claims 1, 10 and 26, and the claims that depend therefrom. Claims 2-13, 15-16 and 18-34 depend from Claims 1, 10 and 26 in addition to reciting additional features. Accordingly, Applicants respectfully request withdrawal of the rejections to these claims for at least the reasons set forth above with respect to Claims 1, 10 and 26.

**Application No.:** 10/696,591  
**Filing Date:** October 28, 2003

No Disclaimers or Disavowals

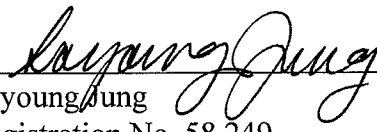
Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicant is not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicant reserves the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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Dated: June 16, 2009

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